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THE HISTORY OF GENERATION.

Examining

The several Opinions of divers Authors, especially that of Sir *Kenelm Digby*, in his Discourse of BODIES.

With

A general Relation of the manner of Generation, as well in Plants as Animals: With some Figures delineating the first Originals of some Creatures, evidently demonstrating the rest.

To which is joyned a Discourse of the CURE of WOUNDS by SYMPATHY, Or without any real applycation of Medicines to the part affected, but especially by that Powder, known chiefly by the name of Sir *GILBERT TALBOT's* Powder.

By NATH. HIGHMORE. lately of *Trinity Colledge* in *Oxford*, Doctor of Physick.

LONDON, Octob. 28
Printed by *R. N.* for *John Martin*, and are to be sold at the Bell in S. *Pauls* Church-yard.
1658.

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To the Honourable,

Mr. Robert Boyle,

Son to the Right Honourable the late Earl of *CORK*, my much Honoured Friend.

Noble Sir,

THere Virtue ſhall bee found in conjunction with Noblity in ſuch black, the laſt and worſt times, it no leſſe invites and amazes the eyes and hearts of be-

holders, then ſome new Star or blazing Comet: but with this difference; the one is cauſe of their fear, the other gives life to their hopes and joy. You have, *Sir*, ſo inricht your tender years with ſuch choice principles of the beſt ſorts, and even to admiration managed them to the greateſt advantage; that you ſtand both a pattern and wonder to our Nobility and Gentry: who in theſe paſt times many of them have ſo ſpent their precious Minutes, that they are ſcarce able to acclaim for one, or ſpend an houre but in vice; that cannot brook Virtue, becauſe it is not born with them; that hate

hate all things that must be obtained by industry. Who most degenerately intrusting their wits as well as fortunes with their inferiours, have made them Master of both; a sad forerunner (I will not say Author) of these sadder times.

But you have made a better and far nobler choice; you have not thought your blood and descent debased, because married to the Arts. You stick not to trace Nature in her most intricate paths; to torture her to a confession; though with your own sweat and treasure obtained. Being ravisht, Sir, with these considerations of your worth and candor, I

shall not fear to throw these Papers into the bosom of your protection; from whom as I cannot misse a judicious censure, so I shall hope for a candid reception. They are Discourses which have busied the Heads and Pens of many judicious and learned, amongst whom our noble Author hath not deserved the lowest esteem. I shall not presume to these phansies with their maturer births. Yet perhaps something may here be found, that may encourage others to a farther search. I shall not despair of your own, which may give a better account and a plenary satisfaction, if it may be,

in these so labyrinthean works of Nature, which is all I have laboured for, and shall still be, (as likewise for the preservation of your health) the prayer of

Sherborne,
May 15.
1651.

Your Honours most
humble Servant,

NATH. HIGHMORE.

An Explanation of the following Figures in both Tables.

THe first Figure, of the first Table, shews the Kidny Bean opened; in which is a little crooked leaf folded up, which being displayed, shews it self, as in the second; and when, being set, it ariſes above ground, it is such a Plant as the third shews; with the very same leaves and no other.

The second Figure shews a Colewort seed: the first shews both leaves, with the stalk folded up, as they lie in the husk of the seed: the second shews it come up out of the ground. The third Figure hath the small germen of an Ash; lying with his two leaves in the kernel of an Ash, both in

in the husk incloſing them. The second shews him sprung up above the Earth, at his first coming abroad.

The fourth delineates the young germen of the Peaſe in the midst of the grain, and its breaking forth.

The fifth shews the young Plant in the midst of the Bean: with the manner of his putting forth, with the same leaves displayed in the third, which are wrapt up in the first and second.

The sixth Figure displayes the young Maple wrapt up in his husk; and how he lies, as in the first. The second shews him a little unfolded, when it is taken out of the husk. The third shews him gotten from his shell, and the surface of the Earth.

The seventh Figure shews what progreſs the Chick hath made in his formation, in the third day after incubation.

The eighth shews the Chick perfectly formed in his shell not long before his excluſion; with the Yolk almost whole; deſcribing the manner of his lying in the shell. The

The second Table shews the growth of the Chick in the first dayes Incubation.

THe first Figure demonstrates the Eggs taken from their shels in a dish, with the Chalazæ, and Cicatricula: which in *A* that was never sat on, is but small. In *B* that hath endured the heat of the Hen one whole day, something dilated. In some new layed Eggs, I have seen it no more altered the third day.

The second Figure delineates the second dayes observations and change in the Egg; the large dilation of the Cicatricula, with all its Circles.

The third Figure shews the growth of the Chick, and alteration in the Egg, the fourth day.

The

The fourth and fifth Figures, shew the fifth dayes addition to the former growths.

The fifth shews him taken from the Yolk, and White, with a delineation of all his parts, as they appear lying round together in the Egg.



An

An INDEX of the Chapters contained in this History of Generation.

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THE HISTORIE OF GENERATION.

The Opinion of Philosophers concerning Generation.

Chapter the First.

THe ancient Philosophers have taught us that all subsisting Bodies consist of two parts, *Matter* and *Form*: the first they would have us believe to be compos'd of four jarring Bodies, which they call Elements, indued with as many proper qualities, which they called *Prime*: as if from the various mixture of these did arise all other qualities.

Some later Philosophers, seeing themselves begirt within so straight and narrow bounds; and finding some effects much out-stripping the power of such a slender mixture, have told us of occult Qualities; which arise from some other Bodies not yet known or discerned in the composure.

Our Chymists assure us for certain, that in the dissolution of all mixt Bodies, they finde other Elements besides those four, we received from the Ancients. And perhaps could their separations and putrefactions be as accurate to distinguish, as Nature is in the mixing, wee might finde many more, from whence these strange effects in several Bodies should arise. For indeed how can we imagine that the complicated and reiterated mixture of heat, & cold, moisture and drought, should ever produce those ridling effects of Mercury, the Loadstone, and many others. But this discourse I shall leave to those that have largely handled it.

The ſecond part which they call *Form, ab informando*, they ſcarce tell us whence it comes; onely magiſterially they teach us, (and we muſt believe them) that it ariſeth from the power of the matter.

But how this, if rightly conſidered, doth agree with their own principles, ſeems ſomewhat difficult to unriddle, *viz.* How a Subſtance (as they grant all Forms to be) can ſubſiſt in an accident, which hath no being of it ſelf, is no leſs a Riddle, then repugnant to their own grounds.

This ſome of our later Philoſophers have very well diſcovered; and ſhewed us, that thoſe Forms w^ch they thought and taught to bee but potentially in the matter, are there actually ſubſiſting; though till they have acquired fitting Organs, they manifeſt not themſelves. And that the effects which are done before their manifeſtation, (as the forming and faſhioning of the parts wherein they are to operate) can riſe from

nothing elſe but from the Soul it ſelf, This likewiſe I ſhall leave to the Readers enquiry, and ſhall follow that other way of introducing Forms, and Generation of Creatures, (as well Animals, as Vegetables,) which gives Fortune and Chance the preheminency in that work. A conceipt lately vented by the noble Author of the two Treatiſes, the one of Bodies, and the other of Mans Soul: Where he deſcribes the motions that are in Plants, (which are Nutrition and Generation;) to be, by one part tranſmitting unto the next to it, the juice which it received from that immediately before. So that there is one conſtant courſe from the root, (that ſucketh this juice from the Earth) unto the top of the higheſt ſprig. And the paſſage of this moiſture from one to another, is in a manner but like the riſing of Water in a Still: w^ch by heat is made to creep up by the ſides of the Glaſs, and ſo by the external cold is faſhioned into that Body which at laſt it is. Let us hear him deſcribing the manner of it himſelf,

The Conceipt of Sir Kenelm Digby *concerning the Generation of Creatures.*

Chapter the Second.

Chap.23. Sect.7. LEt us frame (saies he) a conception; that not far under the superficies of the Earth, there were gathered together diverse parts of little mixed Bodies; which in the whole sum were yet but little; and that this little Mass had some excess of fire in it, such as we see in wet Hay, or in must of Wine, or in wort of Beer: And that withall the drought of it were in so high a degree as this heat should finde no means, (being too much compressed) to play his game: and that, lying there in the bosome of the Earth, it should after some little time, receive its expected and desired drink, through the benevolence of the Heaven; by which it being moistned, and thereby made

made more pliable, tender, and easie to be wrought upon, the little parts of fire should break loose; and they finding this moisture a fit subject to work upon, should drive it into all the parts of the little Mass, and digesting it there, should make the Mass swell.

This increase (saies he) of bulk, and swelling of the little Mass, wil of its own nature be towards all sides, by reason of the heat, whose motion is on every side, from the center to the circumference. But it will be most efficacious upwards towards the Air; because the resistance is least that way, both by reason of the little thickness of earth over it, as also by reason that the upper part of the earth lieth very loose, and is exceeding porous, through the continual operation of the Sun, and falling of rain upon it. It cannot choose therefore but mount to the Air, and the same cause that maketh it do so, presseth at the same time the lower parts of the Mass downwards. But what ascendeth to the

Air

Air must be of the hotter, and more moist parts of the fermenting Mass, and what goeth downwards, must be of his harder and drier parts; proportionate to the contrary motions of Fire and of Earth, which predominate in these two kindes of parts. Now this that is pushed upwards, coming above ground, being expos'd to Sun and wind, contracteth thereby a hard and tough skin on its outside, but within is more tender. In this sort it defendeth it self from outward injuries of weather, whiles it mounteth; and by thrusting other parts down into the Earth, it holdeth it self stedfast, that although the winde may shake it, yet it cannot overthrow it. The greater this Plant groweth, the more juice is daily accrewed unto it, and the heat is encreased, and consequently, the greater abundance of humors is continually sent up; which when it beginneth to clog at the top, new humor pressing upwards, forceth a breach in the skin, and so a new piece like the

main stem, is thrust out and beginneth on the sides, which we call a branch. Thus is our Plant amplified, till Nature not being able still to breed such strong issues, falleth to works of lesse labour, and pusheth forth the most elaborate part of the Plants juice, into more tender substances: but especially at the ends of the branches; where abundant humor, but at the first not well concocted, groweth into the shape of a Button; and more and better concocted humor succeeding, it groweth softer and softer, (the Sun drawing the subtilest parts outwards) excepting what the coldnes of the Air, and the roughnes of the Winde, do harden into an outward skin. So then the next parts to the skin are tender; but the very middle of this Button must be hard and dry, by reason that the Sun from without, and the natural heat within, drawing and driving out the moisture, and extending it from the Center, must needs leave the more earthy parts much

shrunk up, and hardned by their evaporating out from them. This Button thus dilated and brought to this passe, we call the fruit of the Plant; whose harder part encloseth oftentimes another, not so hard as dry. This drought maketh these inner parts, to be like a kinde of dust, or at least such as may easily be dried into dust, when they are bruised out of the husk that encloseth them. And in every parcell of this dust, the nature of the whole resideth, as it were contracted into a small quantity: for the juice which was first in the Button, and had passed from the root through the manifold varieties of the diverse parts of the Plant, and had suffered much concoction, partly from the Sun, and partly from the inward heat, imprisoned in that harder part of the fruit, is by these passages, strainings, and concoctions, become at length to be like a tincture extracted out of the whole Plant, and is at last dried up into a kinde of magistery. This

we call the Seed, which is of a fit nature, by being buried in the Earth, and dissolved with humor, to renew and reciprocate the operation described.

But a sensitive Creature (saith he) being compared to a Plant, as a Plant is to a mixed Body; you cannot but conceive, that he must be compounded, as it were of many Plants, in like sort as a Plant is of many mixed Bodies: But so, that all the Plants, which concur to make one Animal, are of one kinde of nature, and cognation. And besides, the matter, of which such diversity is to be made, must of necessity be more humid, and figurable, then that of an ordinary Plant: and the Artificer, which worketh & moulded it, must be more active. Wherefore we must suppose, that the Mass, of which an Animal is to be made, must be actually liquid; and the Fire that worketh upon it, must be so powerful, that of its own nature, it may

e able to convert this liquid matter, to such breaths and steams, as we ee do arise from Water, when the m or Fire worketh upon it. But lest his moisture being wrought on by such an active heat, should vanish quite away; we must suppose it to have such unctuous parts, that may hold them together; so that the heat imprisoned in this viscous liquid matter, riseth in bubbles: and by reason of its solid unctuousness cannot break forth, but stretch themselves longer and longer; and every one would be as it were a little Brook, whereof the chanel would be the enclosing viscous substance, and the inward smoak that extendeth it, might be compared to the Water of it.

This liquid smoak-like substance, the Fire works on in these Chanels, he makes to be three-fold; First, Watry streams, which first flie out, settle in the remotest parts, and is fittest for figuration. Secondly Oily, which give to the other continuance, and solidity.

Thirdly Fiery, which is made of th grosser, more fixt parts incorporate with Fire, having sufficient moisture to keep it flowing, and is like a Cauldron of fire; and these last vapours are for the continuance of heat. These three Brooks in a sensitive Creature, arise from three Sources or Fountains, the Heart, the Brain, and the Liver, and are conveighed in three severall Chanels; the Arteries, Nerves, and Veins, and give unto the Animal, heat, sense, and nourishment.

A Short Censure of the former Conceipt.

Chapter the Third.

HOw much this Conceipt subverts the antique principles of Philosophy, I shall not here undertake to demonstrate: How far it shoulders out Truth it self, and so blots out those indeleble Characters, fixt by the finger

of the Creator on every ſpecies; thoſe deſcriptions on all his works, the diſtinct conſtitutions, parts, operations, and figures (which are as ſo many Bushes, or Signes hung out, to diſcover what are the inhabitants within) will eaſily ſhew us. For if heat rarifying a ſubſtance, making it thruſt it ſelf into a larger ſpace were the ſole author of all generation; and were the cauſe why Plants grow up in ſtalk and leaves, and downwards in root: we muſt either admit thoſe differing Characters to be vain accidental chances, or elſe look out ſome other agent, from whoſe fruitful womb, this variety might ſpring forth. If we but muſter over the numerous Regiments or ſeveral ſpecies of Plants, and conſider how this grows up with a ſquare ſtalk, that with a round; ſome ſtart up hexangular, others triangular; ſome bear a fruit of one form, ſome of another: and in them faſhion ſeeds, of as differing figures as themſelves. How the leaves

leaves alſo and flowers ſhew as much of variety, as skill in the Workman; every Plant being by them as ſoon diſcern'd, as ſeen. Let us call over likewiſe the differing numbers of Animals, Inſects, and others; and examine all the ſtarting holes, that Fire can breathe forth a ſtream by; all the caſual compreſſures of cold, or external accidents; and compare them together, we ſhall ſee whether ſuch a fruitful ſtock of variety in colours, ſhape form, vertue, and many other differing ſignatures, can be the iſſue of ſuch accidental, and equivocal parents.

If this formation of Creatures ariſe from heat extending, and enlarging a ſmall moiſtned lump; without any other conſideration, why are not theſe Atomes extended circularly; and ſo all Bodies ſhould be caſt into the ſame Mould with the Heavens; and ſhould, as they ſeem to us, be all ſpherical. But he tells us of ſome light parts, that, beſides the power of the Fire enforcing, naturally

turally climb upwards: and of others, which by their natural weight, are perſwaded to ſink into the Earth, to hold the mounting parts ſtedfaſt, that they may not be overthrown by Windes. But were there nothing elſe to give a figure to Plants, but aſcending and deſcending, of light and heavy parts; whence ſhould that variety ariſe in the faſhion of thoſe aſcending and deſcending parts: the weight of the parts ſhould carry them directly downwards, as the lightneſs doth upwards; and ſo all roots ſhould deſcend in one continued round, but long, lump: what then makes ſome ſpherical, others ſtretching out infinite numbers of hairy threds; ſome directly downwards, others parallel to the ſuperficies. The Author tells us the figures of them, as of the aſcending parts, are cauſed by ſome external accidents: As when the more hot and moiſt parts are aſcended, and broken from the priſon of the Earth, the cold air compreſſeth and hardneth the

the external parts, and ſo enricheth the ſprouting upſtart, with a hard tough skin; both armour and clothes to protect the interior ſofter parts. The hardneſs of the Earth, likewiſe compreſſeth the deſcending parts, into ſuch forms as we finde them of. But may not the truth of this be vehemently ſuſpected; when, if we examine the coat, we ſhall finde it more penetrable then the Body: and more ſubject to external injuries, then that incloſed? as in all Trees and Plants, the Bark and Rinde is of a more flexible, tender, and ſoft compoſure then the inveſted Trunk: and the hard ſolid ſhell of Walnuts, Almonds, ſtones of Plumbs, &c. are invironed with a very tender ſubſtance. Beſides this, there is yet a greater doubt, how this external cold air ſhould in the ſame place, at the ſame inſtant of time, faſhion theſe mounting Atoms into a round ſtem, with a long, ſharp leaf; and cloſe by that, compreſs others into a ſquare, hexangular, or triangular

lar ſhape; with leaves round, jagged, indented, ſcollopt, or the like? as may be ſeen in ſeveral Plants, inhabitants of the ſame piece of ground, under the ſame Heavens, inviron'd with the ſame Air, and heavenly influences. Theſe diſtinct figures cannot ſpring from the cold circumſtant Air; for this applying it ſelf alike to all, and every ſide of theſe aſcending parts, ſhould equally compreſſe every part; and ſo all Plants ſhould ſprout up cylindrical, as the Trunks of Trees do.

The Fruit alſo and Seed, which he calls a Button, or greater quantity of thoſe hot and moiſt parts collected, and duſt or parts dried into the form of duſt, by the external heat of the Sun, and innate heat of the Plant; are in a more orderly method framed and repos'd. For not onely in qualities, but in figure, they much vary one from another. One producing a ſeed inclos'd onely in a huſk; another a ſeed of differing figure inclos'd in a fruit, and hard

ſhell. Is cold Air the fruitful Mother of this variety too? Nay, if we but more ſeriouſly examine this duſt, we ſhall finde it orderly ſet, with navel ſtrings, affixt to ſome part of their incloſing Matrix; by which nouriſhment is conveighed for their growth, and ſubſiſtance. And if we ſhall further anatomize theſe duſts, we ſhall finde laid up in them Plants; the very ſame Identical Plants, which firſt grow up, after the ſeeds are committed to the ground. In which indeed reſides the nature of the whole. And this young ſeminal Plant, we may truly call the extracted tincture, or Magiſtery of the whole Plant; as ſhall more largely appear hereafter.

Neither doth his 25 Chapter (where he endeavours to ſhew how this wonderful effect, as he calls it, is performed; how a Plant or Animal comes by that figure it hath) afford us any greater ſatisfaction. For if we examine his firſt principle, *viz.* That the ſeveral figures

of Bodies, proceed from a defect in one of the three dimenſions; cauſed by the concurrence of accidental cauſes; we ſhall finde it extreamly ſtraightning the moſt delightful variety of the Creation, and the infinite power of the Creator. For upon theſe grounds it muſt be ſuppoſed, that the moſt perfect figure is to be cubical, and all Bodies ſhould have been caſt into that mould, but that ſome external cauſes ſtepping in, hinder almoſt all from obtaining that perfection: the Creator not being able to withſtand their prevalency; or by patching up that defect, could not give perfection to all that, which his own mouth aſſures us was good. The examples alſo which he produceth, teach us there is but little truth in this poſition; for how can we conceive the watry drops of rain falling, ſhould ſuffer violence (as to be pared round) by the ſofter Air, which is not able ſo much as to hinder it from falling? The faſhioning of Salts

(as he relates) doth as little ſatisfie. As for Alume, it is not of ſuch unctuous parts as he reports; for how then could it ſo indiſcernably be diſſolved in Water, and ſo much reſiſt Fire, which is not proper to unctuous Bodies? Beſides, being diſſolved and falling again, what ſhould hinder the parts from meeting all in a lump, and conforming themſelves to the faſhion of the bottom of the Veſſel, in which they are contained; as we ſee all unctuous Bodies do? As for Salt, if that ſhould acquire his figure on the ſuperficies of the Water as he informes us, it ſhould be only long and broad, without thickneſſe: whence then come thoſe exact cubical forms in Salts, which are ſuffered to coagulate of themſelvs, Where you ſhall finde the moſt exact Mathematician out-gone by this natural Art. Neither is this cauſed by the falling of parts one upon another, (as hee ſpeaks before of Alume) ere the former are throughly hardned: for then why

why ſhould it not ariſe ſtill in height, by the continual addition of deſcending parts, as long as there are any Attoms to fall, by which meanes it ſhould not become cubical, but a long ſquare. But we finde the contrary, while it moſt exactly caſts it ſelf into cubes; the angles ſometimes looking upwards, ſometimes tranſverſly; which were impoſſible, if thoſe ſquares were made, by long and broad Bodies falling one upon another. And vitriol, though calcined to perfect redneſs, if diſſolv'd and fixt again, not onely recovers his bright ſhining greenneſs, but is ſquared out into various angles, looking every way, as if it had been faſhioned by the hand of the Artificer.

The figure of Saltpeeter is almoſt neglected by him; onely he tels us, that by reaſon of its drineſſe, it is more difficultly figured, and therefore is not equally increaſed. But if we examine it well, we ſhall finde it more unctuous, then the other two, and is more readily

readily caſt into that figure, then the other. For it doth not onely ſhoot forth preſently almoſt in water, after it is removed from the heat; but we ſhall finde it oftentimes upon new Wals ſhot forth to a great length, without the help of Water to faſhion it in. So that there ſeems to be ſome more particular agent to be found out, that immediately imprinteth theſe determinable figures; which ſhould rather work by a conceived deſigne of producing ſuch a figure, in ſuch a Body. How elſe could ſuch effects continually be wrought, (accidental cauſes working not ſtill alike) and therefore it were impoſſible to expect ſcarce a ſimilitude in the works.

The formation of Animals affords us little leſſe perplexity. How heat ſending forth, or how thoſe vapours emitted ſhould ſettle themſelves in ſuch and ſuch method and form; ſuch variety of parts without ſome other director cannot appear. That there are

in

in all Animals three sorts of chanels, is an unquestionable truth; but that there are distinct Bodies conveighed by them, though taught us by our Masters, is not granted, nor by him received for a truth. For in the next Chapter we shall finde him applauding the circulation of the blood; and describing its motion through, and from the Arteries to the Veins, and from them to the Arteries again. Both of these chanels then must be filled with the same liquor; onely perhaps in the Veins it may be something cooler, and thicker; as our Bath waters are lesse hot in the gutters, then in the spring. That which is conveighed in the other chanel, the Nerves, we can scarce afford it the distinction of another Body; it being only the pure, and most subtile selected parts of the blood, which was conveighed in the other two chanels. Neither, if it were granted that three distinct Bodies, were continually traversing those three several

veral chanels into the Bodies of all Animals; doth he shew us, how they put themselves into such various shapes and figures, (when they have escaped this conquering expelling heat) as we finde them wonderfully expresst in every creature.

All things arising in fumes & steams, as moist Bodies wrought on by heat will do, when they are freed from that which rarified them, return to their own nature and forms again. As Water rarified, (when those minute particles of heat that divides it into such small Atomes, and mixed themselves with it, are either lost or overcome by the watery Atomes,) returns again to water. Or if those particles remain still active, they do but further divide it; and so it becomes more like Fire, by having a greater number of fiery Atomes mixed with it, yet is not made another thing, either in substance or figure. But in the generation of Creatures, it is far otherwise; where the

product or effect is much differing from what the matter or the agent were. Now how this difference doth arise, and how this change is wrought, we must enquire a little further, then what heat and moisture will lead us unto.

The true way of Generation set down in general, with the examination of some repugning Arguments, of several Authors.

Chapter the Fourth.

HAving thus far wandered in the search of a truth, examining those opinions which have endeavoured its discovery; and finding them much failing in their labours: I shall the more boldly attempt the same enterprize: hoping if I fail in so great a businesse, to passe along in the crowd, though not undiscern'd, yet favourably censured.

The

The production of all Creatures, after the first Omnipotent *Fiat* was executed; is by Philosophers called *Generation*. Which is performed by parts selected from the generators, retaining in them the substance, forms, properties, and operations of the parts of the generators, from whence they were extracted: and this *Quintessence or Magistery* is called the *seed*. By which the Individuals of every Species are multiplied; and that which the Almighty for its transgression, made to have an end; by the fertility of this Sperm, is continued to immortality.

From this all Creatures take their beginning; some laying up the like matter, for further procreation of the same Species.

In others, some diffus'd Atomes of this extract, shrinking themselves into some retired parts of the Matter; become as it were lost, in a wilderness of other confused seeds; and there sleep, till by a discerning corruption they

they are set at liberty, to execute their own functions. Hence it is, that so many swarms of living Creatures are from the corruption of others brought forth: From our own flesh, from other Animals, from Wood, nay, from every thing putrified, these imprisoned, seminal principles are muster'd forth, and oftentimes having obtained their freedom, by a kinde of revenge feed on their prison; and devour that which preserv'd them from being scatter'd.

Neither are these without their subordinate forms; for from the walls of their bodies frequently, broken by corruption, issue forth other Creatures, differing in *specie* from themselves; as whosoever will but examine the production of *Insects*, shall easily finde.

This seed consists of two parts, *Material Atomes*, animated and directed by a spiritual form, proper to that species whose the seed is; and given to such matter at the creation, to distinguish it from other matters, and to make

make it such a Creature as it is. Both which are separated, the Material Atomes from the body; the form, from the form of the generator. Which in Vegetables, and sensitive Creatures, where the forms are composed of material substances, our Philosophers are easily perswaded to believe. But how the immortal soul of man, should be communicated to these corruptible material Atomes of the seed of Man, without prejudice to its most pure nature, seems a Riddle to our Philosophers, and impiety to our Divines. I shall not undertake those large disputes *pro* and *con* about this argument, but do believe the Soul of Man may be traduced, though not generated; may spread and multiply it self into many, without fear of corruption. It being a substance incorruptible, immortal, like the Creator, the breath of his own mouth, which still retains so much of that nature, from whence it was breathed; that without the least diminution, it

is

is able to communicate, and dilate it ſelf into many Millions, and yet ſtill remain the ſame entire ſubſtance that at firſt it was.

For the material part of this ſeed, there is a large diſpute, whether it be *à toto vel à parte deciſum*. I ſhall not ſtand to tell you the names of thoſe that are Patrons of the one, and of the other: nor rehearſe their Arguments. If you examine them, you ſhall finde theirs moſt rational, that affirm the deciſion from the whole body; what we finde more particularly diſcours't of by our forementioned Author, in his 24 Chapter, we ſhall take up and a little review. Where he hath truly and fully evicted the wandring phancies of ſome, that would have this compound of ſeverall parts, to be collected from every particle, ſo as paſſing by, or through every little Atome of the Parents body, in its paſſage; ſhould be impregnated, and imbued with the nature of it, and ſo retire to the reſerve where

where it is kept for generation. And afterwards theſe particles being fermented by convenient heat, do take their poſture and ſcituation; according to the poſture and diſpoſitions of thoſe Atomes they viſited in their paſſage, and from whom they received thoſe imbibed natures. But this circulating our Author tells us, is impoſſible, I will not wrong him ſo much as to rank his more ſolid reaſons with mine own. Could we finde theſe chanels and conveighances in the Body, by which this matter ſhould paſſe; yet I might doubt of the unqueſtionable verity of this doctrine. For what ſhould hinder this matter circulating about the Body, from receiving qualities, and ſo likewiſe the nature of every part it paſſeth by; and ſo every particle of this matter, ſhould be impregnated with the natures of the whole; and every ſmall Atome ſhould become a living Creature, or elſe the Subſequent ſhould blot out the Antecedent Character,

Character, and the impression should be onely from the last part. We may likewise as truly, as safely conclude with our Author, that it is impossible for every little part to remit some parts impregnated with the nature of that whole part from whence it fell. This by some is thought to be done by that *Quasi epilepsia in coitu*, that kinde of convulsion or concussion of the parts, by which is shook off from them somewhat retaining the nature, and property of every part, and these being joyned, make up the Seed. This seems to be very much befriended by our Authors relation of the Cats kitned without tails: and the Womans daughters with six fingers upon a hand. My self also have seen a kinde of Poultry without rumps: which breeding with their own kinde, still brought forth Chicken wanting that part: If with others, sometimes they had rumps, sometimes but part of a rump. And not long since I saw a Mungril Bitch, that had her tail

tail cut close to her body almost, whose Whelps were half without tails, and half with tails: the next year following, she brought them forth all with long tails, as she had before the cutting off. Which though it seems to favour (as I said) this opinion, it doth no way confirm it; as may appear by the more frequent perfect generations of mutilated creatures; which beget children or issue with two legs or arms, though they had but one; Spaigniels, whose tails are always cut, bring forth Whelps whose tails need as much cutting, as their Dams or Sires did. Wee must therefore look out some other way, how this may be done, without the parts themselves.

Some others have supposed this decision to be made from the blood, when it is *tantum non assimilatus*; after it hath undergone all its concoctions, and received all its names christned by the *Arabians*, of *Humoris innominati, Roris, Glutinis, & Cambii*: and is fastned to

to the part, but not perfectly assimilated; and this being selected, and reposited in convenient vessels, receiving some kinde of impression from the part from whence it was divided; it retains still an imperfect signature, and delineation of them; and makes up that which we call the *sperm*. But I shall here want Anatomie to instruct me, how this Cambium, this thinner, or not yet confirmed, or hardned substance of every part, should desert its hold; and being shaken off, should be conveighed into the seminal Vessels. All which, returns to the first opinion confuted by our Author. Who hath likewise fairly cleer'd the other part of the doubt, whether this matter be divided, or taken only from similar parts alone, and so the matter of bone, should accordingly to the conveniency of place and use, become round, blady, circular, or long, and the flesh likewise, only by the help of fermenting heat.

After our noble Author hath so stre-

nuously confuted these phansies, we shall finde him laying down his own opinion, and seeking some other means and course of Generation: He tels us, that the superfluous part of the nourishment, when it is drained from the rest, and reserv'd in a convenient place, by little and little through digestion gaineth vigour, and spirits, and becomes a homogeneal body, like to other simple compounds; which by other degrees of heat and moisture, is changed into another substance, and that again by other temperaments into another. And thus by the course of nature, and by passing successively many degrees of temper, and by receiving a totall change in every one of them; at length an Animal is made of such juice as afterwards serves to nourish him.

But if we more seriously examine this assertion, we shall finde it to leave the truth very much behinde it. For first, if we but look on the Body to be nourished; we shall finde it to be compos'd

pos'd of many ſeveral parts. of differing natures, which would ſufficiently inſtruct us in the diſagreeing and heterogeneal particles of that which nouriſheth this heterogeneal Body. But if we more curiouſly anatomize this juice or blood, it will abundantly ſhew us, it is no homogeneal Body; neither therefore can that ſuperfluous part ſelected and drained from it, claim that priviledge.

Should we grant this, it cannot appear how heat working upon this homogeneal body, ſhould make in it a total change in the nature of it; or create it an other ſubſtance quite different from the firſt, making it leſſe homogeneal. And in every digeſtion or operation of heat upon it, it ſhould become ſtill leſſe homogeneal, until that ſubſtance be produced which wee ſee compos'd of ſo many heterogeneall parts. If we examine the workes of heat, we ſhall finde it penetrating, dividing, and mixing of ſmall particles of

it ſelf, with the Atomes of the bodies it works upon; and in progreſs of time, divides the body into ſuch ſmall indiviſible parts, that it becomes like it ſelf, in reſpect of rarity. As Fire working on, and mixing it ſelf with Water, divides it into ſmall indiſcernable Atomes, which now attains unto the ſame rarity, and lightneſſe with the Fire; and being accompanied and intermixt with thoſe fiery Atomes, flies aloft, till at laſt diſliking one anothers ſociety, being far removed from the Agent rarifying them, they part companies. And then thoſe unſeen Atomes of Water, collect theinſelves again to their former temper, and bulk, no whit changed or altered either in qualities or ſubſtance, which were impoſſible, were this change total, or could this action of heat create heterogeneall parts, in this homogeneal ſubſtance. If we further conſider the power of heat, (or any other qualities) wee ſhall ſurely finde, that in no action there can any

ſubſtantial thing be given, which is not originally in the agent, or giver. Fire could not give heat, nor Water, moiſture, unleſſe it were inherent in thoſe Bodies. Neither can heat or Fire working on an homogeneal body, give it any other heterogeneal parts then fiery ones; nor moiſture, any other, then moiſt ones, which indeed accidentally may give hardneſſe to bones, and ſoftneſſe to fleſh; but how comes this bony ſubſtance in this place blady, in that round, in another long? this Muſcle round, that triangular? this Plant of one form and nature, that of another? We muſt ſeek out ſome other agent to faſhion theſe parts, and to compoſe this difficulty; and confidently conclude, this way to be lame, and imperfect; of which our Author ſeems to be conſcious, and that makes him ſo ſtaggering, and at laſt falling upon an opinion, which he before in part rejected, *viz.* That the blood in its circulation viſiting every part, is impregnated

nated with the nature of them, and the pureſt part of this blood being extracted like a quinteſſence out of the whole Maſs, is reſerved in convenient receptacles till there be uſe of it; which is the ſeed, of which a new Animal is to be made. This imbuition of ſpecifique qualities from every part, will appear as impoſſible as the former. For firſt, there are many parts from which the blood doth not again return, as from all thoſe parts, which have attracted their ſpecifick nouriſhment from out of the veſſels; from them there is no return made. Beſides, the blood, in its circulation, is carried in veſſels of the ſame nature, from the one end of the body to the other; and out of thoſe veſſels there is not the leaſt motion in the blood. How theſe qualities ſhould be communicated from every particle, through the thick skins of the veſſels, ſeems ſomewhat ſtrange. Beſides all this, ſhould we grant this circulation through every particle, how comes

comes it to paſſe that receiving ſo many differing qualities, the one doth not confound the other, and that which is laſt impreſt doth not blot out all the reſt? Theſe or the like difficulties being kenn'd by our Author, makes him flye to another refuge; and to tell us, that the heart of every perfect Animal, containeth in it, the ſpecifick vertues of all the ſeveral parts of its own body; by reaſon of the bloods continual reſorting to it, in a circle from all parts of its body, and its being nouriſhed by that juice; ſo that the Heart is the abridgement of the whole, and imbueth the blood with thoſe ſpecifick qualities, from whence is extracted the ſeed. But neither can this cleer all the former difficulties. For how ſhall we ſuppoſe, ſo many diſtinct qualities to be impreſt in ſo narrow a compaſſe, as in the heart, without confuſion; or how ſo ſhort a ſtay in the heart, could implant ſuch a numerous Regiment of qualities in the blood; or why not differing

fering faculties in the ſame particle of blood; all ſliding (without diſtinction) through the ventricles of the heart? we ſhall be forc'd therefore to ſeek out ſome other way, which indeed our Author hath chalkt out unto us, though himſelf hath not trod in it.

A more particular Narration of the way of Generation.

Chapter the Fifth.

OUr noble Author hath laid this ground for us, which I hope will eaſily lead us to the truth, *viz.* That it is neceſſary the parts ſhould be made in generation, of a matter like to that which maketh them in nutrition. Now what that is from whence every part receiveth his nouriſhment, wee muſt ſearch for in the blood: Which is a tincture extracted from thoſe things we eat, concocted and ſeparated in the Stomack,

Stomack, Liver, and Heart; and afterwards by its circulating in the Arteries and Veins, is pellican'zed (as the Chymists term it) and becomes most pure, and defæcated from all its excrements, and is made a fit nourishment for every part. The things we eat are not simple, but compounded of as great a variety as the parts to be nourished can expresse. What variety of Plants goes to the making up of one piece of flesh we eat? What multitudes of differing Atomes are conjoyned in one piece of bread, or draught of drink, or Wine? The extract then sure must be furnisht with as great a swarm of differing parts; onely here they are more refin'd, more subtiliz'd, and separated one from another. But how doth this variety of parts in the blood, make it the fitter for nourishment? by comprehending in it small indivisible particles, cognate or similar Atomes, which are of the same substance, essence, and nature with the parts, to which

which they are to be adjoyned, and assimilated: and want nothing but separation, and afterwards union and conjunction with, to be part of those particles, for whose nutriment they were provided; which operation is called assimilation. For then these similar, or cognate parts, are become like to those, to which they are joyned.

How nutrition is made. And this is the matter and manner of our nutrition, w^ch^ if slightly considered, may perhaps go amongst the number of falsities. But if we examine from the Creation, the product of Creatures from the confused first created Chaos; or since that time, the continual hourly decay, or expiration of every part of us, (in so much that Physitians allow us clearly a new Body every seven years.) we shall soon discover the truth of this position. How the great Architect fetcht from the bowels of this Lump, precreated particles, to supply him with fit matter for such bodies; and appropriated

priated forms for ſuch matter, will inſtruct us that there are ſuch particles, which being brought together conſtitute ſuch bodies. The continual expiration of particles from all bodies, will more cleerly illuſtrate it. The hourly decay is by expiration of material, the laſt diſſolution is both of material and formal Atomes. Now as all agree that material parts throughout multitudes of (nay all) mutations, remain incorrupted; ſo alſo according to, not onely the judgement, but ſeveral experiments of knowing men, diligent inquirers into the various works of Nature, and mutations of natural compounds; natural forms themſelves alſo do not periſh at their parting from their matters; but onely are diſſolved and diſſipated, lying after that in their ſcatter'd Atomes, confuſed and mixt with ſome others; conſtituting perhaps a quite differing body; ſo that the entity of the form, continues after corruption; though not in the formality of ſuch

ſuch a form. If it be ſo then that the matter of every particle in every body, and the Atomes of their forms likewiſe, ſtill remain, though ſcatter'd into millions of ſeveral bodies; what ſhould hinder, (when theſe Atomes are again rallied,) an eaſie union with particles of the ſame condition, and nature? and why ſhould not then the blood, which is made up of many and diſtinct bodies, be furniſht with the ſeveral Atomes comprehended in thoſe bodies: and thoſe Atomes being agreeable to our parts, be as eaſily united to them?

The way of nutrition being cleared; let us ſee now, how from the ſame matter generation is performed. This blood, that all parts might be irrigated with its benigne moiſture, is forc'd by ſeveral chanels, to run through every region and part of the body; by which means every part out of that ſtream, ſelects thoſe Atomes which they finde to be cognate to themſelves. Amongſt which

which the Testicles (destined to that office from their first creation, as the Stomack and Liver were to digest) abstract some spiritual Atomes belonging to every part; which had they not here been anticipated, should have been attracted to those parts, to which properly they did belong for nourishment. As the parts belonging to every particle of the Eye, the Ear, the Heart, the Liver, Stomack, Guts, the Hand, every particular bone, and muscle, &c. which should in nutrition, have been added (to repair the continual deperdition) to every one of these parts, are compendiously, and exactly extracted from the blood, passing through the body of the Testicles; and being in this Athanor cohobated and reposited in a tenacious matter (lest being spiritual, and very fine, they should lose their vigor) at last, passe from the body of the Testicles, by certain vessels, in which through infinite Meanders, it undergoes another digestion and pellicanizing,

canizing, (as in another place I have shown.) And from thence, being now delivered from all its excrements, and furnisht with Atomes, fit for the making of every part and particle of an other Individuall; is treasured up in certain Granaries, till the seed time comes. And this is the nature, substance, and manner of collecting the Seed. This shall be further illustrated by the several wayes of Generation in severall Creatures, and first in Plants.

How Plants are generated.
Chapter the Sixth.

THese seminal Atomes are in the same manner separated by all Vegetables, w^ch^ are watered in every Region by a certain juice, or blood which they attract & suck from their Mother Earth: which is nothing else but a confus'd Mass of multitudes of forms, and substances, fit

What the Earth is.

fit for the nouriſhment and reparation of all things In which a Plant being fixt, preſently ſends forth his Purveighers on every ſide, his roots, wch ſupply the want of hands and mouth, to bring in its proviſion; who are finely palated too, & able to make choice of that tincture, which moſt delights their palats, beſt fits their own diet, and is moſt proper to repair their decaying ſelves in every part. This juice or blood they concoct,& ſtrain through their finer parts; and ſeparate them from other earthly excrementitious particles, (or ſuch as belong to another ſpecies) till it becomes fit only for the repairing of that Plant, for, and by which they were ſelected, and ſuckt out of the Earth. From this quinteſcence, this juice, are ſelected parts of the ſame ſubſtance, nature, qualities, and form with the Plant, and agreeing with every particle of it, whoſe blood it is, and from it, is the ſpecies propagated. But not after the ſame method, in all, for in

in ſome, propagation is made by this juice reſiding in part of the Plant, pulled from the Trunk, and fixt in the ground: In others, by part of the root transfer'd: In others, by ſeed.

The firſt is done by that juice which is retained in the part taken from the Plant, which reſerving parts fit for the nouriſhment of every particle in the Plant, from whence it was taken, hath now ſome parts which are veſſels, for that Sprig which is to be propagated. For thoſe Atomes which in the juice were to augment and repair the root of the Tree, being rapt from the Tree, are of no uſe, not having a root to adjoyn themſelves unto. Being therefore not attracted by any part of the Sprig, as not cognate and fit nouriſhment for them, by often circulation, about this beginning Plant, are at laſt united, (other parts being drawn from them) and by their freedom from thoſe parts, and union, become

How a Sprig put into the ground grows.

become more vigorous, and will not be idle: but ſince they cannot be imployed, drawn by, and adjoyned to other parts; they will ſet themſelves to work, and falling to their proper place, the loweſt region of the Sprig, collect themſelves in the ſame method they ſhould have done in the root, to which they ſhould have been adjoyned. And there finding the bark ſoftned by the external moiſture of the Earth, and fitted to give way to them; being thus ſetled, they thruſt forth themſelves into the Earth; from whence they extract cognate juice, with all ſorts of Atomes fit for the augmentation and nouriſhment of themſelves, & the whole Plant. And thus grows up a Plant of the ſme kind wth the old ſtock.

The 2d is performed by theſe ſeminal Atomes reſiding in the top of the root; wth part being ſeparated, acts in the ſame manner as it did in the whole Plant.

The laſt ſort is by Atomes, ſelected from this juice, when the Plant is

grown to his full bigneſs, and wants no more for his further growth at that time, and laid up together in convenient receptacles: which is a more perfect operation of Nature then the two former are.

In the former wayes, theſe Atomes lye confuſed in the juice; and are not ſeparated, but by the parts to which they are to be adjoyned. But in this, theſe Atomes are methodically repoſed, and laid up in ſuch forms, as they appear to be a very Plant, incloſed within a skin, with ſuch leaves as they diſcover themſelves with, at their firſt breaking the Earth. The Atomes belonging to the root, the ſtalk, the leaf, are all laid together, and ſet in their right places, and make up a perfect Plant, the very ſame which firſt comes up out of the Earth. If the Seed be great, they are eaſily diſcovered. In the ſeed of the Aſh, the skins being removed, in the middle of the kernel ye ſhall finde two white tender leaves

lying one upon another, with a ſtalk reaching to the point of the ſeed, (not that which is faſtned to the tree, but the other) to which is looſely adjoyned, as it were, a navel ſtring from the ſtem, conveighing nouriſhment to this young Plant, while it is upon the Tree: as in the third Figure of the firſt Table is delineated. In the Maple, both greater and leſſer, though the ſeeds be winged as the Aſh, yet theſe ſeminal Atomes or this young Tree, is incloſed in the round knob; within whoſe tough and harder skins, is found a ſtalk and two leaves rowled round together, which are the very ſame that firſt comes up: as in the ſixth Figure is diſcovered. In Beans and Peaſe, betwixt the kernel, you ſhall finde thoſe very leaves which firſt break the ground, with a ſtalk, whoſe end paſſeth through one of the thicker skins, and is contained onely within the outermoſt thin skin: as in the ſeveral faces of the fourth and fifth Figures is deſcribed. Which if it

be any way moiſtned by an adventitious moiſture; preſently gives way to the ſwelling ſtalk and leaves, which when they are diſtended beyond the capacity of the outmoſt skin, break forth and ſhew themſelves. In other ſmaller ſeeds, the leaves are incloſ'd and rapt round, the ſtalk lying betwixt them; as in the Cabbage and Radiſh ſeeds; figure the ſecond. But when they break through the ground, they erect themſelves upright, ſometimes carrying the hard skin up upon their tops. The greater ſeeds have, beſides theſe ſmall plants, a ſubſtance which we call the kernel; unto which their ſtalk is faſtned, neer about the middle of them, by two ſhort ſtalks; from which ſubſtance they receive nouriſhment, while they are incloſed within their skins, and matter afterwards for the diſtention of the ſtalk and leaves, after they have enlarged their territories, both upwards and downwards, in root and leaves: as in Beans, Peaſe,

Wheat,

Wheat, Barley, Acorns, whoſe parts turn into a milky ſubſtance, fit nouriſhment for theſe tender Plants. That theſe ſeminal Atomes do conform and diſpoſe themſelves likewiſe, according to the ſame method they did, or ſhould have done in the Plant, whoſe they were, or for which they were prepared for nouriſhment, will eaſily appear by that artificial generation of Plants, which not onely caſually hath faln out, but by many hath ſtudiouſly been effected. When from the powder or liquor of Plants, (as is related by *Libarius*, and others, I need not name the Authors being ſo common an experiment) they ſhall again be recalled to live, and ſtart up ſtalk and leaf; which but now was duſt, or liquor. I ſhall onely relate one experiment caſually, though twice made by a learned grave Phyſitian, neerly related to me: which will explain the manner of this operation to the full.

Having in the evening expos'd a

decoction for a cliſter (made of Violet leaves, Strawbery leaves, Mallows, and the like) to the cold of the night. The next morning he found it covered with a ſlender cruſt of Ice, which gave him leave through it to behold in the Water, the leaves in their perfect ſhapes, of all thoſe Plants, of which the decoction was made, both in faſhion and colour; which remained in that poſture till the Ice was broken; which was no ſooner done, but all thoſe fictitious Plants preſently vaniſhed, nothing remaining but the cleer liquor of the decoction.

Now how this could be performed, unleſſe it were by the union of theſe ſeminal Atomes diſperſed in the liquor; (drawn from the other parts, by the gentle heat of the Fire acting with the Water) diſpoſing & ſetling themſelves in their right and natural places, will appear impoſſible. How could a ſlender heat in ſo ſhort a time give a form, or ſquare out ſuch a matter into that figure

figure which but now it lost? or why when the matter is thus fashioned, should it not retain that figure and bulk when the inclosure is broken? We must therefore conclude, that these seminal Atomes of the Plants, which were separated from the other parts by decoction, and by the sudden closure of the Ice intercepted from flight; were actuated by some remaining particles of heat, and put in minde of their office and nature; insomuch that every Atome began to seek out his proper situation and neighbour, to settle themselves in such method as they held one towards another, before they were parted from the Herbs, and so make up perfect Plants both in figure and colour. But the Ice being broken, and the liquor moved, these appearing Plants, being made of such fine spiritual parts without cement; were soon shattered into their first indivisible particles; which being again dissolved, and the order broken, could not be by the sense discerned.

The reason why these seminal Atoms could not then constitute a perfect solid Plant, was, because there was wanting some other more fixt parts of the same nature, and condition, with these more spiritual, to conserve them in that posture, and to cement them together; to fix and harden them into a consistence. These are of the same nature, particles belonging to every part, Atomes of Leaves, Stalks, Flowers, Fruit, and Root as the others; but are grosser, more terrestrious, which cannot act themselves; but give solidity, strength, and hardnesse to the other when they are joyned together; and are so exactly united with them, when the Plant is entire; that they cannot, but by dissolution of the whole, be distinguished. These in this decoction, were left behinde in the expressed Stalkes, Rootes, and Leaves, and therefore the Plants were not permanent.

The conſideration of theſe two parts in the conſtitution of a Plant, will give us a light of the cauſe of the diverſity of the Sexes in Animals; whoſe way of generation follows next.

How Animals are generated.

Chapter the Seventh.

THe generation of Animals is as various almoſt as their ſeveral Species; whereof ſome derive their Pedegree from the corruption of Dirt, Mud, and other Animals; ſome ariſe from the funerals of Plants, and ſtart up a moving ſenſitive piece, which but now grew a vegetable. Others again of a more noble Progeny, owe their beginnings to ſome ſeminal parts derived from the Genitors; but repoſed in certain veſſels excluded from the Females, and left without the ſphear and guidance of their forms; ſuch are all births

births breaking forth from the incloſing walls of Eggs. The more excellent Animals after their formation, are contained (till they acquire ſome degrees of perfection) within the precincts of one of the generators. All which, or the moſt of them, I ſhall proſecute in the following Diſcourſe.

The firſt rank of Animals ariſing from corruption of other creatures (as Eeles from Mud; Flies and Wormes, from Beaſts; the Scarabeus from Oxen; Lice from the filth of moſt Creatures.) Theſe I ſay, grow up upon the mutual juncture of ſuch Atomes, which before lay ſcattered in the bowels of ſome other compound; and wanted nothing but union, to faſhion them into ſuch a frame and ſtructure: which, as ſoon as poſſible they can obtain their freedom, put themſelves in rank and order, and become another living thing, differing from that Species whence it had its birth. This is ſeen in the Miſſelto, which grows upon

on other trees, very evidently; the juice which nouriſheth and conſtitutes this Plant, is drawn from the Earth, with the juice belonging to the other tree it grows from, and is perfectly mixt with, not to be diſcerned from it; till after long circulating about the ſeveral parts of the tree, it is refuſed by all, as unfit for them. At laſt uniting in ſmall lumps, they diſcover their differing natures, by parting from the parts of the tree, and when they are in ſuch a proportion united; thruſt out thoſe ſtalks, and leaves, and fruit, which we call Miſſelto. Theſe particles of the Miſſelto may be diſcerned united in ſmall lumps, a good way from the eruption out of the tree; where ye may finde many ſmall green drops, as it were, hardned, incloſed in whiter wood of the other tree. So theſe ſeminal Atomes, taken in with the ordinary nouriſhment of thoſe creatures, are carried up and down through their parts; but received of none,

none, to be perfectly united with any; but being diſpers'd in ſmall parcels, they cannot eaſily unite themſelves, till a greater portion of them be met together; w^ch^ generally is at the Spring, when the Suns heat begins to contribute vigor to them; and diſſolves the excrementitious humors of the Body they are incloſed in; ſo that they much eaſier obtain their freedom, and ſo uniting themſelves in their proper method, and order, become ſuch creatures as thoſe Atomes can fitly conſtitute. Theſe Animals too, ſometimes alter their external forms, and become another thing then what at firſt they ſeemed to be; as from a Worm, the next advancing Sun ſalutes a Butterfly; ſuch is the growth of all Inſects, which appear firſt to be Worms; the Tadpoles grow to be Frogs; the ſpitting or eggs of Flies, to be Worms, and then Flies again; which is cauſed by the addition of new parts, which they themſelves procure from their nouriſhment;

nouriſhment; by which theſe parts become larger, ſolider, and ſo diſcernible, which before could not be ſeen. As the germen or young plant in the ſeed, when it hath obtained a new ſtock of moiſture and nouriſhment, puts out leaves of a differing form from thoſe which firſt come up; as the Maple, Borage, Cucumber, and almoſt all plants differ in their ſecond leaves, from their firſt, which manifeſtly appear incloſed in the ſeed. The other are ſo ſmall and wrapt up, that until there bee new parts adjoyned from their nouriſhment, they are not diſcerned.

Theſe imperfect Animals ſpring not up alike indifferently, from all Bodies; ſome Animals being made of one kinde of Matter, ſome of another; ſome Plants retaining the ſeminal Atomes of one Inſect, ſome of another; ſo that from one Plant or Animal ariſeth one kind, from another, another. I ſhall not ſtay to look out their ſeveral originals.

The

The way how thoſe Creatures are generated which owe their beginnings to Eggs.

Chapter the Eighth.

THe other two more perfect generations, are made by the conjunction of theſe ſeminal Atomes, extracted from both generators: who both of them contribute ſuch Atomes, as being laied together in their proper places, would conſtitute an Individium of that Species. One of which incloſes and layes up theſe united ſperms, with a proportioned quantity of nouriſhment, for the growth and perfection of the Fætus, in an Egge. From which all Fowles, moſt kindes of Fiſhes, Snakes, Spiders, Frogs, and ſome other Creatures are brought forth. This Egg is compos'd in the Matrix of the Females, and is the product of theſe ſeminal Atomes ſelected from the nutrimentall juice

juice of both; the Femal adding thoſe parts fitted for the growth and nouriſhment of the Fœtus, from her own blood. The yolk, the groſſer aliment, is compoſed in the Vitellary, or Egg-bag, ſelected from large veſſels immediately ariſing from the Aorta. The other part, the White is made in the Matrix, by a certain milky viſcous exudation, flowing from the rough wrinkled membranes of the Womb; whoſe property it is to convert that blood, which by ſeveral great veſſels is brought to it, into that milky ſpermlike ſubſtance.

Beſides theſe ſeminal parts there is (I ſay) a contribution of nouriſhment conveighed with them in the ſame Egg, for the nouriſhment and growth of the Fœtus, while it is incloſed in thoſe walls. And this is, as I ſaid, of two ſorts, agreeable to their double uſe, fitted for their nouriſhment while the Atomes are uniting, but tenderly cemented, and growing together: and this

this is the White, which is more agreeable to the nature of Sperm; and anſwers to the Mothers blood, which gives growth and nouriſhment while the Fœtus lives in the Mothers womb.

The other, the Yolk, of a more ſolid and confirmed ſubſtance, is for its nouriſhment when it hath atchieved ſome perfection and growth; the parts then expecting a more ſolid nutriment. This ſupplies the uſe of Milk in other Creatures, who for a time after their excluſion are nouriſhed altogether by it.

Both of theſe, White and Yolk, are incloſed in Membranes; ſome of which being hardned into a ſhell, are excluded from the Femal daily as they grow to perfection. And that becauſe ſuch ſmal bodies as theſe Ovipara are, cannot contain ſo numerous a progeny together, as their fruitful wombs do yearly diſcloſe.

In which none of theſe parts, either White, or Yolk, theſe ſeminal Atomes are

re repoſited, is doubtfully related. Some affirming them to reſide in the Center of the Yolk. But this will eaſily be rejected, when ye ſhall ſee the whole Animal-framed, and the Yolk yet entire, whole, incloſed within its own membrane: onely ſome ſmall threadlike veines full of blood ye may ſee thruſt into it, conveighing ſome of it, as nouriſhment to the Fœtus.

Others think the White to be that, of which the Chick is framed and faſhioned; but not rightly neither; for that likewiſe is to be ſeen whole, when the body is formed.

Fabritius, who hath taken a great deal of pains in diſſections, a ſtrict enquirer into Natures ſecrets, eſpecially concerning the manner of Generation, ſuppoſes theſe parts to reſide in the Chalazæ: that part which by our Women is called the treddle But this likewiſe is falſe; for then every Egg ſhould produce two Chickens there being one treddle at each end of the Egg; which

 ſerve

ſerve for no other end, but for ligaments to contain the Yolk in an Equilibrium; that it might not by every moving of the Egg be ſhakt, broke and confuſed with the White. What therefore I have often obſerved I ſhall here diſcover, and in it the true manner of their formation.

Fabritius makes mention of a little white Circle, or Cicatricula on the thin Membrane of the Yolk; which he ſuppoſes to be a skar, left by the breaking off from the foot-ſtalk, by which it was faſtned to the Hen, before the White grew about it. But if ye further obſerve it, ye ſhall finde it another thing. *Pariſanus* would have it to be the ſeed of the Cock. I think it to be the ſeminal Atomes derived from both, here repoſited; as the following Obſervations will diſcover.

In the Hen, while all her Eggs are but Yolks, or ſmall little grains contained in the Egg-bag, or Vitellary; ye may perceive this white Circle or

Cicatricula

Cicatricula, which afterwards, as the Yolk increaſeth to bigneſſe, doth appear more evidently.

When the Egg is perfect, if you break the ſhell at the bigger end you ſhall finde this Circle in all prolificial Eggs; the faſhion of it you may ſee in the firſt Figure of the ſecond Table, the innermoſt Figure, A.

This Cicatricula after the firſt dayes incubation, you ſhall ſee dilated and grown wider, as in the firſt figure at B, with a little white ſpot in it, eaſily to be diſtinguiſhed from the reſt.

The ſecond day being paſt, in the third day ye ſhall finde it ſpread yet larger. I have ſeen it enlarg'd to the breadth of a Sixpence, diſtinguiſhed with ſeveral Circles within it, exactly round, repreſenting the Eye. The outmoſt round was of a much paler yellow colour then the reſt of the Yolk, and of a thinner conſiſtence, as if it had bin by the heat of the Hen diſſolved & melted. Within this was a leſſer Circle

cle of a moſt reſplendent cleerneſs; through which did paſſe ſome ſmall white threads into the outmoſt pale circle. This inner clear Circle was of a ſubſtance like to the white of the Egg, but clearer, and very fluid. Within this clear round, was another of a pale yellow, like to the firſt; which incloſed another transſlucid Circle within it, in which was a clear ſmall Body, but ſomething obſcurer then the incloſure, containing in it a little whiter ſpot, eaſily to be diſtinguiſhed from it: which ſeemed to be center to all the incloſing circles. This you may ſee in the ſecond figure of the ſecond Table. The inner white Circle and ſpot in the after diſcoveries, will be found to be the Carina and heart of the Chick. The two clear Circles to be that liquor, or humor, in which the tender Atomes of the Chick, while they are collecting and conjoyning, do ſwim in; that by external motions they might not be diſordered and hindered from union,

on. The middle yellow was ſome of the ſame matter, not yet diſſolved into that clearneſs. The outmoſt yellow Circle was ſome diſſolving by the heat of the Hen, and preparing for the making of blood, from which it now differs onely in colour; which the next day or the day following will appear in thoſe ſmall threads, conveighed to the white ſpot within: which the fourth day ye ſhall finde filled with this blood, and moving.

Towards the latter end of the third day, you ſhall finde this Cicatricula to be all clear in the middle Circles, the yellow being obliterated; and now remains onely the white Circle and ſpot in the middle, ſomewhat enlarged, circumſcribed by a larger reſplendent Circle; environed with the outermoſt yellow round; in which, by the help of Glaſſes may be diſcovered the ſmall veſſels coming from this diſſolved yellow matter, from every ſide to the middle of the white Circle; which by

a Microſcope appears now to be the Carina or back and neck of the Chick, and the heart in the midſt of it: this is delineated in the ſeventh Figure of the firſt Table.

On the fourth day, this Cicatricula was ſpread the full compaſſe of the big end of the Egg; the outmoſt Circle whereof, was filled with veins variouſly ſpread abroad, and Arteries, as might be ſuppoſed, (though by their coats not to be diſtinguiſhed,) becauſe their Anaſtomaſes were evident; which being collected into four trunks from the oppoſite points, paſſed through the refulgent clear Circle to the middle or center. Without the extream limbe of this pale yellow Circle, were no veſſels to be ſeen.

Within the white Circle in the middle, which was much dilated too, appeared a red ſparkling line encompaſſing the white ſpot, now red too, and moving: whoſe motions plainly ſhew, it was the heart; as afterwards I ſaw

by

by the help of a Microſcope, exactly ſhewing me the heart perfectly faſhioned, with both his ears, and this red line joyned to it, running quite round in the inſide of the white Circle. By the help of this Glaſſe, I ſaw the motions of the heart and ears for a long time; one anticipating the other, and continuing after the others decay. When the hearts motion was almoſt ſpent, the ears contracted themſelves in due order, and after five or ſix pulſations of the ears, the heart would move once, and then reſt again, till after ſuch a number of pulſes were performed by the ears.

The heart when it had emptied it ſelf, by its continual pulſation, of all the blood, and was become perfectly clear, and tranſparent as before the blood came to it; moved a long time after, obſerving the ſame order, following the pulſation of the ears, as when it was watered from that bloody Fountain.

This Glaſſe ſhewed me the head too, conſiſting of three bubbles as it were; whereof one confeſt it ſelf to be the eye, by the manifeſt diſcovery of the Pupilla in the middle. From hence the Spina was carried round almoſt to the head again, which is that tranſparent white Circle without the red line. From whence appeared ſome ſmall obſcure clouds, faſtned in the proper places of the wings and thighs: which in the fifth dayes obſervation, appeared to be ſo indeed, without the help of Glaſſes. Beſides, from this Carina, were drawn ſome ſmall ſtreamings, which were the rudiments of the ſucceeding ribs This fourth dayes obſervation may be ſeen delineated in the third Figure of the ſecond Table.

The fifth dayes this tranſparent clear body, together with the Fœtus ſwimming in it, ſunk lower to the ſide of the Egg, then in the day before; and what was then clear and tranſparent, begins now to thicken and grow obſcure,

ſcure. The head is beyond its proportion grown outſtripping all the reſt; as if Nature made haſte in finiſhing that part, of which ſhe ſhould have moſt and ſudden uſe. The eye grown almoſt to its perfect bigneſſe, and diſcernable in all its parts, the greater diviſions of the brain, and Cerebellum eaſily to be ſeen. The Carina or Spine diſcovers it ſelf encompaſſing the red line or Vena Cava, which was now ſcarce diſcernable by reaſon of that clothing it had by this dayes addition, procured: the heart too, obſcurely covered, almoſt hid from view, excepting a little in the forepart, which ſeemed open, or at leaſt not ſo much hardned as the other, but continued tender and cleer ſtill. The wings and legs eaſie to be obſerved, without Glaſſes, being much whiter then the reſt. The bulk of the body hardned into a viſible form and obſcurer then before, yet not ſo darkned, but that the pulſation of the heart being red with blood

blood might be diſcovered through it: which after it had layen ſtill for three hours at leaſt, I afterwards layed it in the Sun, whoſe vigorous heat renewed its life and motion again. This thin body being opened, from the great vein might be ſeen ſome rudiments of the Liver, ſome ſmall puttings forth of veſſels, which had ſome blood between them hardned. This fifth dayes obſervation you may ſee in the fourth and fifth Figures of the ſecond Table.

The ſixth dayes obſervation ſhews every part more diſtinctly, and what before even by the help of Glaſſes ſeemed but darkly adumbrated; now begin to confeſs themſelves by their viſible ſhapes and actions. The three bubles of the head are much enlarged, the eyes perfected, the wings and legs grow out: the heart appears fleſhy and corpulent, the rudiments of the Lungs, Liver, and Guts, appear more clearly.

The ſeventh day ſhews all more perfectly yet, and it now appears in the ſhape

shape and figure of a Chick, perfectly accomplisht with all its parts; wanting nothing but confirmation and hardning, which every day now increases, to the diminishing of the white; w^ch about the tenth day is done: there remaining little more then that thin clear liquor the Chick did swim in: the yolk entire, and appearing bigger then before; being rarified, and as it were dissolved, by the heat of the Hen: and brought into a fit condition to be by the continuing heat reduced into blood, obtaining from that gentle Furnace colour, and fluxibility. After which time there is little observable till the fourteenth.

About the fourteenth and fifteenth dayes, the beginnings of the feathers appear, the skin being covered with little black spots, which are the roots of the feathers. The skull begins to cover the brains. The umbilical veins plainly discover themselves: of which the first that was spread through the white

white of the Egg, passes through the upper part of the Liver, perforating the Vena Cava, near the basis of the heart. The other coming from the yolk insinuates it self into the Vena Porta, in the lower part of the Liver. Which shews what difference Nature hath made betwixt these two liquors: the one, the white, concocted and fitted for present use, is carried immediately to the Vena Cava and to the heart, to be distributed into every part for their encrease and nourishment; out of which every part might select cognate and appropriated Atomes, separated from all excrements, for their augmentation and nutrition

As soon as this is done and spent, because the Fœtus is not yet strong enough to seek his own nourishment abroad; neither is the Hen able to provide for it: Nature hath ordained another reserve of provision, which though it be not so fine, yet having another Cook to dresse it, the Liver being

being now perfected, it will by undergoing another dreſſing or concoction there, be made fit for the nouriſhment of the now hardned and confirmed parts of the Chick. And therefore Nature ſends what is melted and diſſolved by the external and internal heat, from the yolk to the Liver, by the Vena Porta, to be there dreſt and cookt again. From whence ſome excrements are ſeparated, as by the fulneſſe of the Gall, and the green excrements in the guts may appear.

To theſe two venal Umbilical veſſels are added two Arteries, ariſing from the Lumbary Arteries. Which accompanying the veins throughout the white and yolk, make a perfect circulation here, as well as betwixt the Mother and the Fœtus in Viviparis: by which means the new concocted blood mixt with this, is without trouble or danger brought to the Fœtus.

And therefore it is (I ſuppoſe) that the heart ſo ſoon before any other part

part performs his office; that by his continual motion, driving that diſſolved clear liquor, (which is found in and about his veſſels, and melted by the external heat) and forcing it into the white, may melt and diſſolve that too, and make it fluid, apt to be carried along with it, returning in other veſſels back to the heart, where it receives new vigor, and an addition of heat. By this means the liquor being increaſed, the veſſels are not large enough to contain it; and therefore the heart thruſting it forth with the ſame continued violence, hourly drives it further into the white firſt, and afterwards into the yolk; where it ſtill melts more, and the diſſolved circle is ſtill enlarg'd; as by the daily obſervations will appear.

After this time you ſhall finde the white clear liquor, in which the Chick did ſwim, conſumed too; and the Fœtus lying on the yolk, & entire yet, as on a pillow. Whoſe outward membrane

brane being either united to, or elſe the ſame (which is moſt probable) that cloſes the Chicks belly, and indeed clothes the whole Chick; holds now both yolk, umbilical veſſels, and guts altogether. And as the yolk daily leſſens by the growth and increaſe of the Chick; this membrane is contracted, and the guts with the yolk by degrees are drawn up into the belly, and cloſed up by this skin; where a portion of it may be ſeen after the Chick comes abroad, if by diſſection it be enquired after, and ſerves to nouriſh it, even after it is diſcloſed. So that in theſe creatures there is no footſtep or ſigne left of the Umbilical Veſſels, or Navel ſtring, as in others; but both veſſels and nouriſhment are incloſed within the belly of the Chick: A figure of the Chick thus formed, ſome few dayes before his excluſion, you may ſee in the eighth figure of the firſt Table.

And now the Chick is perfectly fitted to come abroad, and ſeek his own

proviſion; and indeed it is almoſt time, having ſpent his patrimony, he muſt now ſeek other food: Being ſtraightned likewiſe within the priſon of the ſhell, and wanting now the air to breathe in; for the allaying that heat which now the moiſture being ſpent) begins to enflame; and hath ſo dried the ſhell that it becomes friable, by his continued ſtrugling and turning round, with his ſharp beak from under his wing, he breaks through thoſe walls, which now impriſon him, and were before his Caſtle, exactly dividing the ſhell in the middle.

From theſe obſervations of the daily progreſſe of the Chicks increaſe, we may ſee the manner of their generation which muſt be in this ſort. The ſeminal Atomes conſtituting the Fœtus, collected from the blood by the teſticles, and joyned together in the womb or vitellary: contract to them from the femal blood that round body which ſerves afterward for their nouriſhment,

(as

(as I have related) the yolk, which from ſeveral ſmall threadlike veſſels, receives nouriſhment from the blood, until they come to their accompliſht bigneſſe. On which (as I have ſhewn) theſe ſeminal Atomes being fixt, by the former obſervations you clearly ſee, how they daily grow up into a living thing of the ſame ſpecies. And this ſeems to be as the Germen or little plant repoſited in every ſeed; wch grows up to a bigneſſe not to be contained within the skins of the ſeeds, but breaks through that and the earth that covers them; and then ſhews themſelves in a viſible form and bulk, which before could not, but by the curious obſerver, be diſcovered.

This Cicatricula in the ſmall grains in the Vitellary, ſeems to be, nay are the ſame ſeminal Atomes, diſpoſed in their due method and places which they obſerve one towards another; as when they appear in a more viſible bigneſſe afterwards. For before they are ſate

on by the Hen, there appears in this Cicatricula ſome diſtinction of parts; there is a little white ſpot, in the middle of a white circle to be ſeen; which particles never vaniſh, but grow larger ſtill, till they diſcover themſelves what they are. The middle ſpot is found to be the heart, the white circle becomes the Carina or Spine; at the end whereof, three or four dayes incubation ſhews the head; and ſo the reſt of the parts as Nature hath need of them, grow up to their offices in their viſible figures. So that theſe ſeminal Atomes as ſoon as they are conjoyned in a convenient place, by the due ordering and regulating of the ſpecifick ſoul, put themſelves in order, fall to their proper places, and make up a Chick before the Egg be perfected. As the germen in the ſeed of a Plant (as I have ſhewn) is perfectly faſhioned in the ſeed, though it diſcovers not all its parts, till by addition of new particles, they grow to a bigger bulk, and become more viſible.

The

The firſt work that is performed by the Hens heat in incubation, is a diſſolving and melting as it were of the finer and more ſpirituous parts, which are moſt ſenſible of the firſt and leaſt heat; by which means the ſeminal particles are cleared and ſeparated from other parts; and thoſe finer parts appointed for his firſt nouriſhment, are clarified, melted, and made fluid, and apt to be moved and diſperſed by the white ſpot or heart.

And this is the true way of generation of theſe Creatures; whoſe eductions, as well as thoſe of Plants, our Author brings as inſtances for his equivocal generations. Which as they fail his expectation of clearing thoſe accidentall cauſes, he ſo much depends on: ſo they clearly ſhew, that as in the ſeed of a Plant, there are actually ſuch parts repoſited, as do make up a Plant perfectly formed. So in an Egg before incubation, where both ſeeds are conjoyned, the parts of a Chick are orderly

derly diſpoſed, by the conjunction and regular diſpoſure of theſe Atomes; which while they were parts of the blood, ſerved for the nouriſhment and increaſe of that body from whence they were taken, but now ſerve to make up another Individuum of the ſame ſpecies.

Of the generation of Animals that are brought forth alive.

Chapter the Ninth.

I Have been ſomething the longer in explaining the former wayes of generation, becauſe as their diſcovery is eaſier; ſo they more plainly illuſtrate the way and method of Generation. Which, how fitly it may be applyed to thoſe that produce living births, in this enſuing diſcourſe ſhall be examined.

Theſe, as the former, are the iſſue of a double Sex; and onely differ in this, that they are incloſed in the female, till they are perfect. I ſhall not here ſtand

in

in the examination of that doubt, whether or no the femal contributes any ſpermatical particles, towards the formation of the Fœtus, in Coition. When we ſhal obſerve what parts Nature hath beſtowed on the females; I mean teſticles, (for ſo they are, and not glanduls for I know not what uſe:) to which are derived Arteries and veins, of the ſame original with thoſe diſtributed to the Maſculine ſtones: and when in theſe teſticles ye ſhall finde ſpermlike matter, and veſſels from them to the womb. When alſo in coition ye ſhall obſerve the ſame delight and concuſſion as in Males; why ſhould we ſuppoſe Nature, beyond her cuſtome, ſhould abound in ſuperfluities and uſeleſſe parts.

The principles therefore of theſe living births, ariſe as the other from ſome ſelected Atoms by the teſticles of both, thrown into the Matrix of the Female. Where being united & mixt by the fermenting heat of the womb: the ſeveral Atomes fall to their reſpective places:

the ſoul playing the skilful Workman, (not laying brick where ſhould be morter) repoſing every Atome in his proper place, that very ſame which it ſhould have held in the body, from whence it was ſeparated.

While this is doing the tenacious part of the ſperm, in which theſe Atomes were laid up, is now hardned into membranes, incloſing ſeveral ſubſtances; the one incloſing the pure ſeminal Atomes which are in faſhioning themſelves, in a clear tranſparent liquor as in the Egg; the other incloſing both that, and the other parts of the ſeed from which theſe Atomes are enlarged and nouriſhed.

This outward Membrane, ſticking to, and about thoſe aſperities, or papillar extuberancies, which are cauſed by the orifices of Arteries, and Veins opening into the cavity of the womb, gives way to the gently diſtilling blood, to deſcend to theſe Atomes; to furniſh them with ſtore of cognate parts, to

be

be ſelected by, and added to them for their future growth.

But that theſe yet tender parts, may not be overwhelmed with too great a flux of blood, and be ſtifled with too much nouriſhment, before they are able to diſpoſe of it: (a frequent cauſe of abortion) Nature ſuffers it to wander through a Labyrinth of an infinite number of veſſels, diſpers'd through this outmoſt membrane; from whence by one chanel it is conveighed to this new Animal. But not to remain all of it, within the limits of this little frame; but being conveighed to the heart of the Infant, by its continuall motion ſome is thrown into every part, according to the capacity of their veſſels. And becauſe all parts of this too, are not fit for the repair of theſe young Atoms, but do require a greater choice; therefore at every motion of the heart, ſome of this blood is thrown out of this Infant, by appropriated Arteries, back to the Mother again. So that by this

this continual circulation of the blood, through this new Animal; freſh and cognate moiſture is ſupplied to irrigate, and augment every part of it. From whence, as at the firſt, cognate Atomes are ſelected & adjoyned to every particle, until the Fœtus come to perfection; and then breaking through thoſe membranes, it is brought forth a living creature.

It will be requiſite I ſhould here ſatisfie a doubt, which may perhaps perplex ſome in the receiving this opinion of generation, *viz.* why there ſhould be a diſtinction of Sexes? and why there ſhould be a collection of theſe ſeminal Atomes by both Sexes? and that without the admixture of both theſe, there could be no generation?

The reaſon why there are diſtinct Sexes, is, becauſe one of them muſt ſupply the part, and office, that the Earth doth to Vegetables; which is, to contain, preſerve, and ſupply it with fitting

fitting nouriſhment; which is done by the Female. But why cannot all bee done by this one? what need is there of another ſeed?

The uſe of theſe differing ſeeds, is evidenced in the former diſcourſe of Plants: where I ſhewed you, that theſe ſeminal Atomes were of two ſorts, ſpiritual, and more material; whoſe duty was to fix and cement the ſpiritual Atomes together, that they might mutually cohere the one to the other; the Maſculine, are to actuate, enliven, and to act for all the reſt: and this diverſity of Atomes, makes a difference in ſeeds, and a diſtinction in Sexes. The Maſculine ſeed having undergone concoctions and ſeparations by a greater, and purer heat, becomes more ſpiritualiz'd, & ſubtile; and is like to thoſe ſpiritual Atomes of the appearing and riſing Plants out of the ſpirits of a former Plant corrupted, as I before declared. Which contains in it all parts fitting to conſtitute ſuch a body,

body, as that was from whence it was taken: and being thrown into a convenient place, where it may have room and agreeable heat, would by the diſpoſing of every Atome into his proper place, conſtitute a perfect body. But not being furniſht with thoſe more material particles, it would ſoon vaniſh (as the appearing ſuppoſititious Plants did) theſe ſpiritual Atomes not being cemented and conjoyned together.

The feminine ſeed being extracted after the ſame manner, from the ſame veſſels, by the female teſticles, containing the ſame particles, but cruder and leſſe digeſted, from a cruder matter, by leſſe perfect Organs, is left more terrene, furniſhed with more material parts; which being united in the womb, with the ſpiritual particles of the maſculine ſeed; every one being rightly, according to his proper place, diſpoſed and ordered with the other; fixes and conjoynes thoſe ſpiritual Atomes

mes, that they ſtill afterwards re-ain in that poſture they are placed

I ſhall forbear the proſecution of is any further, having ſufficiently leared the wayes of generation of erfect bodies. I ſhall proceed to ſhew e cauſes of ſimilitude in the Fœtus o the generators, and of mutilated nd imperfect births.

How different Sexes, and ſimilitude of the Fœtus with the generators is cauſed.

Chapter the Tenth.

THe conjunction of theſe ſeminal material Atomes of both Sexes, cauſeth this ſimilitude of parts, and marks, with the parents that begot them. For according to the exuberancy, or power of the Atomes of either Sex, ſo is the Fœtus faſhioned and diſtinguiſhed. If the Atomes conſtituting

ting the Maſculine parts prevail, the is a Male generated: but if the A tomes of the Females ſeed prevai either in quantity, or energy, ove the Maſculine; then is the product a Female: and thoſe Atomes which were ordained for, and belong to the Maſculine parts, being but few in number, and leſſe in power, are obſcured, being ſcattered amongſt the reſt, or elſe being of no uſe, and having no parts to joyn with them, to unite and cement them together, are quite loſt.

This is the cauſe too, why the Fœtus or Infant hath parts, ſome reſembling the Father, ſome the Mother, having ſometimes the Mothers Lip, the Fathers Eye, &c. according to the prevalency of the reſpective Atomes.

Beſides, by how much the more the Maſculine Atomes abound in a Female Infant; by ſo much the more the Fœtus is ſtronger, healthier, and more Manlike, a Virago. If the Female Atomes abound much in a Male Infant, then is that

that issue more weak and effeminate. If either parent hath any extraordinary mark, or part more then usual; as the Woman with six fingers; whom our Author relates to have born all her Females, with the like number of fingers: this caused by these seminal Atomes extracted from the blood, carrying along with them Atomes belonging to every part, communicated to the seed, and so to the Infant; especially if the Atomes, in which these supernumerary parts or marks reside, prevail over the rest. As the example of that Woman illustrates, who brought forth all her Males with the usual number of fingers; all her Females with six upon an hand, like her self. The Sex shewed the prevalency of her seed, which having the mastery of the Masculine, all the several Atomes contained in her seed, shewed themselvs in the same posture, as in her own body. In the Males, those particles of her seed being weaker, served onely to cement the masculine Atomes, and no more.

The

The cause of defect of some part or an ill disposition of them in place they ought not to be in; may be from the avocation and disturbance of the imagination of the parent, at that time when these Atomes are in disposing and ordering by the soul of the Infant in their proper places. This I say, is done by the imagination of the Mother disturb'd, representing to the Infants soul, then disposing and ordering these Atomes, either some other pattern by which it conforms its work; or else wholly calling it away from that operation, suffers these Atomes confusedly to unite and dispose themselves as well, as being disordered, they may; and so make up a monstrous kinde of birth. Or else the soul being disturbed, and the Atomes disordered; they joyn not to one another in their proper places, but the Atomes of the leg joyn with those of the side, or the arm, or the head. Sometimes supernumerary particles are found in the seed,

which

which being many and prevalent, do unite themselves, and joyn to some others, and there put forth; so that there are seen sometimes two perfect bodies, conjoyned in one part or other; or four arms, &c. as several Histories relate of severall monstrous births. That seen amongst us of late years, being none of the contemptiblest of that kinde. I mean the young man that had a head, arms, and legs of another body growing out of his side.

But here arises a great difficulty, how this disturbance of the seminal Atomes, should be occasioned by the disturbance of the Mothers phansie? How the imagination works upon parts of the same body, Authors tell us, is by the mediation of humors and spirits: but how it should operate upon these seminal Atomes, at this time, before there is any influx either of humors or spirits from the body to them? I cannot yet finde satisfaction from any.

I should think it done by the mediation of the soul, traduced with the seeds. Which being of the same essence, and part (as I may say) of the Parents soul; it retains still the same affections and passions that it had before its traduction. Hence the soul of the Mother being disturbed, this soul of the Infant, by that consent and harmony which is betwixt them, must be disordered too: which causes that disorderly concourse of the seminal Atoms, and those monstrous births springing from it: as I before declared.

Some Arguments against this opinion proposed, and answered.

Chapter the Eleventh.

OUr Author brings in an opinion of Doctor *Harvies* to father his accidental formation upon, so much contrary to me, that I cannot baulk the relation

relation and examination of it, *viz.* That the seed of the Male, doth not remain in the womb of the Female in any sensible bulk: but (as it seemeth) evaporateth, and incorporateth it self either into the body of the womb, or rather into some more interiour part, as into the seminary vessels, which by mediation of the Females seed, suck up the Males seed, and turn it into a vapour, operating in such sort as our Author before relates, in the generation of Animals. And after a certain time, some six weeks, or two moneths, (as the Doctor observed in Does and Hinds) these seeds distill again into the womb, and by little and little do clarifie in the midst, and a little red speck appeareth in the midst of the bright clearnesse.

The right observation of this experiment (under favor) in my judgement was not truly made; for this inspection into the wombs of creatures cannot be, but by dissection; which must certainly hinder that second work, namely

the returning back of the seed into the womb: And if so, how shall it come to our knowledge, that the seed which at the time of accoupling, was received into the womb, and afterwards when the observation was made was evaporated, and attracted by the Females testicles, shall afterwards distill into the womb again; unlesse the same Female were preserved to make those distinct observations, at several times. I should rather believe the Does, or Hinds in whose wombs the Doctor found no sperm after the accoupling, were barren, and so never received the Masculine seed into their wombs or at least never retained it; or else had not then coupled with the Male. And that after the two moneths, he met with some others that had conceived, in which he found that resplendent clearnes and red spot. All which will not amount to a considerable argument, to support this change of substances by accidental causes.

Not

Not unlike to this is that opinion of *Fabricius*, asserting that the seed of the Cock is not cast into the womb of the Hen; but into the beginning of the Matrix, and there by an irradiating influx fœcundates the Hen, and makes fruitful all the eggs that shall for a long time after be produced, without any admixture of the seeds at all. This opinion of his is grounded upon the impossibility (as he supposes) of the entrance of the Males seed into the Females womb; the inner orifice being so closely shut, that from without it is impossible to receive any thing. Besides in dissection, he could never finde any part appointed for the ejaculating the sperm into the womb. The Penis *or Prick* being wanting in the Cock; so the seed cannot be thrown further then the entrance into the womb.

Whether or no there be a present union of the material parts of the seeds, after every coition, which impregnates the Females; former observations

have not fully discovered. Those which are casually made by dissection of Females, at, or neer the usual time of coupling, may easily deceive us. For if nothing be found in their wombs then; we may as safely and conclusively argue, that either that Female never coupled with the Male, or never retained his seed as to say it is impossible for the seed to enter, because I never found it there The experiment ought to be made on some creatures, under the continual view of our observation; and presently after copulation, if we see nothing reflowing again; then to search where that seed lyes, will undoubtedly discover the truth to us.

That observation of Doct. *Harvies*, related to us by Sir *Kenelm Digby*, (though I confesse his curious eye, seldome takes any thing upon trust, or slightly passes by what is observable) seems to presuppose a conception: and on that supposition to ground his opinion, that the Males seed is not retained

ined in the womb, but evaporated; ecauſe in his diſſections of thoſe creaures he ſuppoſed had conceived, (beauſe done at the uſual time of coupling) he never found it: till after, ſome two moneths, meeting with others whoſe pregnant wombes diſcovered ſome rudiments of a growing Fœtus; he concludes, thoſe creatures, he two moneths before diſſected, would have ſhewn then, the fertility of their wombs in the ſame manner. We may as truly argue (I ſay) they had not conceived, at the time of his diſſection; neither (had they eſcaped his knife) would they, without a new coupling, have had that red ſpot, in the midſt of that clear body.

But when wee ſhall conſider the great quantity of ſperm, emitted by the Male in every coition; and ſee that quantity retained by the Female, if by that copulation ſhe conceives; and finde no other part capacious enough to keep it, but the

womb: when we ſhall finde the material parts of the Male, copied out to the life in the Fœtus; even his marks, which never came under his ſight or knowledge peradventure, to be branded on the young one: we muſt needs acknowledge ſomething more then an irradiation, or fœcundating quality, impreſt on the womb by the Maſculine ſeed; and more then phanſie in the Females to produce ſuch effects, A Hen trod by a Pheaſant, though in a dark room, that ſo ſhe could never ſee his proportions or colour, brings forth Chickens, reſembling both her ſelf and the Pheaſant. A Bitch lined with ſeveral kindes of Dogs, though in the dark, where her phanſie could not operate to the aſſimulating of her births, brings forth her whelps faſhioned and coloured, like to all thoſe ſhe coupled with. The Horſe leaves ſome material impreſſions of himſelf, on the Mule, which he begets on the Aſſe.

That ſtrict cloſure of the wombs orifice

orifice in the time of diſſection, cannot exclude the ſeeds entrance. For wee know in the time of coupling in all Creatures, thoſe parts, all of them are much differing from themſelves, at other times, dilated, and ſwollen up by a more then ordinary heat, encreaſed by an extraordinary afflux of blood to thoſe parts, at that time. Which heat not onely increaſeth the deſire, but dilateth the cavities and pores: that thoſe parts will now be open, which before were ſhut. The Hen, and Does in coition elevate the Velabrum, which at other times cloſely ſhuts that paſſage. So it will be no marvel, if the ſtraight orifice of the womb in coition ſhall open, to admit that gueſt ſhe ſo much deſires; and moves it ſelf directly, to receive what is thrown into it by the Male.

As for his ſecond ground, that the Cock wants that part which ſhould ejaculate the ſperm into the Matrix: diſſection will ſhew us that, though it be

not ſo conſpicuous as in other creatures; yet at the termination of each ejaculatory veſſel, cloſe by the Orifices of the Ureters, may be ſeen ſmall extuberancies: which if compreſt will be diſtended to a greater length, emitting ſeed from their terminations. In coition we cannot but beleeve them much extended, as in all other creatures; which afterwards are flaccide and contracted. So that if we may believe diſſection (the ſureſt guide) we ſhall ſee Natures bounty to this creature; whoſe ſalacity exceeding others, Nature hath beſtowd two parts, whereby he may ſatisfie his deſire. And indeed it was neceſſary ſo to be, for having no common receptacle, to receive the ſperm from both teſticles; as the Proſtata in other creatures: one Penis could emit but from one ſtone; therefore are there two, that in coition either by turns, or together, he may emit theſe ſeminal parts, from both teſticles. The defect of this

part

part then will bee no argument to prove *Fabricius* his irradiation only.

I muſt here take away one ſtumbling block more, which our Author hath laid in my way, in confutation of that opinion, favouring the actual exiſtence of all things, in all bodies. Which becauſe it may ſomething reflect on this my opinion of the way of Generation; I ſhall a little review it.

He to confute this way of Generation and nutrition, furniſheth us with an example to illuſtrate his Argument; which bears the weight and vigour of his Argument, and may ſeem very much to infeeble my foregoing Diſcourſe. Suppoſe (ſayes he) a Man, a Horſe, a Cow, a Sheep, and 500 more ſeverall Species of living Creatures, ſhould make a meal of Lettice: to avoid all perplexity in the Argument, let us allow, that every one did eat a pound; and and let us conceive another pound of this herb to be burned; as

as much to be putrified under a Cabbage root, and the like, under five hundred Plants more of divers Species. Then caſt how much of every pound of Lettice is turned into the ſubſtances that are made of them, or that are encreaſed by them: as how much aſhes hath been made by one pound, how much water from another by diſtillation; how much a Man hath been encreaſed by a third, how much a Horſe by a fourth, &c. And when you have ſumm'd up all theſe ſeveral quantities, you will finde them much to exceed the quantity of one pound; which it would not do, if every pound of Lettice were made up of ſeveral different ſimilar parts actually in it, that are extracted by different ſubſtances of the nature of thoſe parts: and no ſubſtance could be encreaſed by it, unleſſe parts of its nature were originally in the Lettice.

In anſwer to this, we ſhall return this confeſſion, that if it were certain that

that all of ſo many diſtinct Species, that have altogether different parts one from another, did, or could from the ſame quantity of one Plant or thing, receive a valuable bulk of nutriment; his Argument would remain exceeding valid and conſiderable. But when it cannot be made appear, that every one takes ſomething of the quantity, and is nouriſhed by it. Nay, when the contrary appears, that all are not nouriſhed by the ſame food: Some chooſing one ſort of meats, ſome another; one feeding on, and living by that, which kills another; this growing fat by that, which ſtarves another. It will appear that there is a choice and election of Atomes in that which nouriſhes, appropriated to the Species for which they are provided: and aſwell a ſelection of thoſe Atomes again, to conſtitute a new Individuum of that Species. In diſtinct Regions we finde ſeveral ſorts of Plants and Animals, which are the proper off-ſpring of thoſe

thoſe countries; which are nouriſhed by things peculiar to that countrey. If they be transferr'd, they either degenerate, or die, wanting their proper aliment; but ſeldome or never propagate their kinde.

Non omnis fert omnia tellus.

Beſides, if it can appear, that many Species are fed with the ſame thing: it will be found likewiſe that they are thoſe Species, that have many or moſt parts reſembling one another. And then no doubt in the ſame aliment, they may every one finde particles fitly applicable to thoſe corresponding parts: and no leſſe able to conſtitute their members, then anothers.

It may yet be objected; If the ſeminall Atomes do ſo diſpoſe themſelves in their due and natural orders, as to make up a body reſembling the Species; or at leaſt to lay the firſt foundations, and rude draught, as it were, of a Body. Why are they not

not thus diſpoſed, and ſetled in the ſeminal veſſels of both Sexes, as ſoon as the ſperm is made? There wants neither heat nor life to actuate them.

To this I ſhall anſwer; firſt, that perhaps if theſe ſeminal Atomes had convenient room in thoſe veſſels, they might be conjoyned in an orderly method. And therefore Nature hath ſo ordered theſe veſſels, that the parts, both ſeparating and containing theſe Atomes, ſhould not be one continued cavity as the Matrix is, which receives them in coition; but ſhould be a glandulous and porous body; in which the particles or Atomes of the ſeed lie ſcattered, and parted one from another by the ſubſtance of the glandule. For firſt, theſe Atomes are ſeparated by the teſticles, a glandulous body; next, they are conveighed to the Proſtata, a glandule too; in which they are reſerved until the time of uſe. In the Ejaculatory veſſels, their paſſage

paſſage betwixt the teſticles and Proſtata; though they circulate through divers Meanders, and Cavities; yet there they cannot rank themſelves in order, becauſe they are in continual motion, (the ſubſequent particles ſtill driving on the former) which hinders their conjunction: reſt being the Mother of Union. Thoſe ſeminal veſſels, which in diſſections are found joyned to the Proſtata, having many Cavities, and full of thin liquor, do not contain theſe ſeminal particles, but the Proſtata, (as I ſaid) and from thence in coition are they emitted. The liquor that is found in theſe ſeminal cavities, ſupplies perhaps (beſides that other in coition) the office of the thin tranſparent liquor in the Egg, in which the Chick ſwims, and by which the finer parts are nouriſhed at firſt, that is firſt concocted into the blood.

Beſides, theſe Atomes in their ordering muſt (I ſaid) be regulated by the ſoul, traduced with them; which is not

not faſtned to the ſeed, while it remains in the ſeminal veſſels, more then to the blood, or other humours in their chanels, on whoſe loſſe or preſervation the ſoul doth no way depend.

Neither in all emiſſions of ſperm, is the ſoul conveighed with theſe ſeminal Atomes, that in any place it may conſtitute a body. In all involuntary emiſſions, the ſoul is not communicated to the ſeed. But then onely, when the generators ſoul by a voluntary act, intent on propagation and multiplying her ſelf into another Individuum, diffuſeth her ſelf into the now parting ſperm, then only is it prolifical Which coming into a convenient receptacle, where theſe Atomes may repoſe; being moved onely by that ſoul which accompanied them, and from which they received their orders and commands, are ſoon ſetled into their proper places, and become a perfect Individuum of that Species.

Thus have I diſcovered the wayes of generation;

Generation; which being cleared too of all thoſe doubts, that could be raiſed againſt it; will eaſily pronounce, that phanſie of our Authors, to be but the iſſue of an acute wit, not the birth of his maturer judgement. If in this Diſcourſe I have erred, I ſhall not marvel at my humane frailty, but hope to finde as favourable a Cenſure.



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